REMARKS

Upon entry of this amendment, claims 1 - 13 will be pending in the above-identified application. Claims 1, 5, 7 and 12 have been amended herein.

Reconsideration and allowance of all claims are respectfully requested in view of the following remarks.

Applicants note that the Office Action Summary did not indicate whether the drawings filed December 12, 2003 are acceptable and respectfully request clarification.

Applicants are compiling legible copies of each U.S. and foreign patent and publication listed in the IDS for prompt transmission to and consideration by the Office.

Claim Objections

Claims 1, 5, 7 and 12 were objected to because of informalities. Claims 1, 5, 7 and 12 have been amended as indicated in the current listing of claims to correct the informalities.

Section 102(b) - Humphrey and Mitra

Claims 1-2 and 5-8 were rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 6,171,239 ("Humphrey").

Humphrey describes a system and method that control prostheses and other devices with signals received by sensors implanted *directly in the brain,* not an electrocorticography-based system. Sensors consist of microelectrodes with microscopic tips (< 300 um surface area) that are inserted directly into brain matter to receive multi-cellular signals from *single or small clusters of neurons* by microscopic tips

that are positioned within 10 - 100 um of a single neuron (*see, e.g.*, abstract; figs. 4, 5, 6; column 7, lines 65-67 - column 8, lines 1 - 8).

In sharp contrast to Humphrey, and as clearly articulated in the application, the claims of the present invention application are based in part on the surprising discovery that electrocorticography (ECoG) signals arising from the use of low impedance, larger surface area electrodes placed on the *surface* of the brain cortex can be successfully exploited to control an external device in real time. Prior to the present invention, such ECoG signals had not been successfully used to control external devices. Moreover, prior to the present invention, it had been believed that electrical signals such as ECoG and EEG would not be useful for real-time control of external devices. Humphrey, at column 2, lines 45 - 65, notes this fact and actually teaches away form the use of larger surface area, low impedance electrodes, noting that the resulting signals have such low amplitude and are so contaminated by extraneous neural activity that they are not desirable and not useful for real-time neural control of an external device. Applicants also refer the Office to pages 7- 9 of the Specification of the present application for a comprehensive description of ECoG signals, how they are obtained, processed and used, and why use of same compares favorably with use of microelectrode arrays as described by Humphrey and also with EEG-based systems, for the purposes of brain-computer interface technology.

Claim 1 clearly recites an electrocorticography (ECoG) array configured for acquiring ECoG neural signals, not single cell or small multi-cell clusters and is therefore clearly patentable over Humphrey. Claims 2, 5 and 6 depend from claim 1 and, when the recitations of claims 2, 5 and 6 are considered together with the

recitations of claim 1, claims 2, 5 and 6 are therefore also clearly patentable over Humphrey.

Claim 7 recites a method including providing an electrocorticography (ECoG)-based brain-computer interface configured for determining an intent of the user from ECoG signals of the user's brain activity. Humphrey does not describe use of an ECoG-based brain-computer interface and therefore claim 7 is patentable over Humphrey. Claim 8 depends from claim 7 and when the recitations of claim 8 are considered together with the recitations of claim 7, claim 8 is therefore also clearly patentable over Humphrey.

Section 102(e) - Mitra

Claim 1 was rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,615,076 ("Mitra et al."). It appears also that claims 2 - 4, and 6 - 12 were rejected under 35 U.S.C. 102(e) as being anticipated by Mitra et al.

Mitra et al. describes use of neural activity of a subject to predict intended movement, where the neural activity that is measured is the local field potential recorded at a microelectrode, or single neuron ("single unit") activity, recorded using single tetrodes *inserted into* brain cortex. Applicants again point to the important distinction between use of electrode sensors implanted *directly in the brain*, and the electrocorticography (ECoG)-based system of the present invention. Not least, to obtain the single unit activity of the type used by Mitra et al., cortical *micro*electrodes penetrate brain cortical tissue, resulting in tissue damage, scarring, encapsulation, and increased risk of infection.

In clear contrast to Mitra et al., and as previously argued with respect to Humphrey, the claims of the present invention application are based on use of electrocorticography (ECoG) signals arising from the use of low impedance, larger surface area ECoG electrodes which, though they can be placed subdurally, are nevertheless placed on the *surface* of the brain cortex and not inserted into brain matter.

Claim 1 clearly recites an electrocorticography (ECoG) array configured for acquiring ECoG neural signals, not single cell or small multi-cell clusters and is therefore clearly patentable over Mitra et al. Claims 2 - 4, and 6 depend from claim 1 and, when the recitations of claims 2-4 and 6 are considered together with the recitations of claim 1, claims 2 - 4 and 6 are therefore also clearly patentable over Mitra et al.

Claim 7 recites a method including providing an electrocorticography (ECoG)-based brain-computer interface configured for determining an intent of the user from ECoG signals of the user's brain activity. Mitra et al. does not describe use of an ECoG-based brain-computer interface and therefore claim 7 is patentable over Mitra et al. Claims 8 - 11 depend from claim 7 and when the recitations of claims 8 - 11 are considered together with the recitations of claim 7, claims 8 - 11 are therefore also clearly patentable over Mitra et al.

Claim 12 recites a method of controlling movement of a cursor on a computer monitor in real time comprising monitoring electrocorticography (ECoG) signals of the brain activity of a subject, and analyzing the ECoG signals to determine the intent of the user with respect to the cursor movement. Mitra et al. does not describe monitoring

electrocorticography (ECoG) signals of the brain activity of a subject, and analyzing the ECoG signals to determine the intent of the user with respect to the cursor movement, and therefore claim 12 is patentable over Mitra et al.

Section 103 - Mitra et al. and Kanamaru et al.

Claim 12 was rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,615,076 (Mitra et al.) and further in view of U.S. Patent No. 5,298,890 (Kanamaru et al.).

Mitra et al. was described and distinguished *supra* with respect to the 102(e) rejection.

Kanamaru et al. describes a movement system and method for moving a pointer device-driven cursor position. Kanamaru et al. does not describe or suggest a method for controlling the movement of a cursor using collection and analysis of ECoG signals, and therefore Kanamaru et al. does not supply the deficiencies of Mitra et al. as a reference against patentability of claim 12. Therefore, claim 12 is patentable over Mitra et al. and Kanamaru et al.

Section 103 - Mitra et al., Kanamaru et al. and Wolpaw et al.

Claim 13 was rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,615,076 (Mitra et al.) and further in view of U.S. Patent No. 5,298,890 (Kanamaru et al.) as applied to claim 12, and further in view of U.S. Patent No. 5,638,826 ("Wolpaw et al.").

Mitra et al. and Kanamaru et al. have been described and distinguished *supra* with respect to the 102(e) rejection of claim 12.

Wolpaw et al. describe a communication method and system using EEG brain waves for control. Wolpaw et al. do not describe or suggest a method for controlling the movement of a cursor using collection and analysis of ECoG signals and therefore Wolpaw et al. do not supply the deficiencies of Mitra et al. and Kanamaru et al. as references against the patentability of claim 13. Therefore, claim 13 is patentable over Mitra et al., Kanamaru et al. and Wolpaw et al.

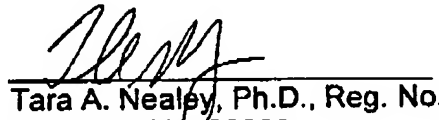
CONCLUSION

Applicant has included a Credit Card Payment Form in the amount of $225.00 for a two-month Extension of Time. However, any additional applicable fees can be charged to Deposit Account No. 19-3140.

If the Examiner believes that there is any issue which could be resolved by an Interview, the Examiner is respectfully requested to contact the undersigned attorney at the telephone number listed below.

Dated: 5/2/2005

Respectfully submitted,



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